



October 9, 2020

ATTN: Document Control Desk
Director, Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

REFERENCE: Docket No. 50-186
University of Missouri – Columbia Research Reactor
Renewed Facility License Operating License No. R-103

SUBJECT: Written report, in accordance with 10 CFR 71.1, as required by 10 CFR 71.95(b) [for NRC Docket 71-9338], regarding conditions in the Certificate of Compliance for the Safkeg – HS 3977A, USA/9338/B(U) – 96, that were not met during shipment

Dear Sir or Madam:

The University of Missouri Research Reactor (MURR) submits this letter to report a condition pursuant to 10 CFR 71.95(b) regarding the use of the Safkeg–HS 3977A, DOT Competent Authority USA/9338/B(U)–96, Revision 3, NRC Docket No. 71-9338.

The following is a description of the event, reported in accordance with 10 CFR 71.95(c):

(1) Brief abstract of the event

The conditions contained in the Certificate of Compliance (CoC) for the Safkeg–HS Model 3977A, DOT Competent Authority USA/9338/B(U)–96 (Safkeg-HS), were not met in their entirety for a shipment of liquid I-131. Contrary to Section 7(b) of the CoC, the package was not prepared for shipment in accordance with the Package Operations in Section 7.0 of the application. Specifically: A Model No. 3987 shielding insert was used in the package where the serial number of the insert body did not match that of the lid as required by Section 7.1.3 (3) of the Safety Analysis Report (SAR).



(2) Narrative description of the event

On September 23, 2020, MURR shipping staff began the preparation of a Safkeg-HS shipping package for transport of radioactive iodine-131. For transport, the iodine-131 is loaded in a Model 3987 shielding insert which is placed in the cavity of the package containment vessel (CV). As per MURR Procedure BP-SH-028 and MURR Control Check Sheet FM-163, the serial number located on the body of insert was compared to the serial number on the lid prior to loading the radioactive material. The shipping staff found that the body Serial Number was 0020 and did not match lid Serial Number 0022. The insert body and lid were immediately removed from service in compliance with MURR shipping program procedures. A different insert was retrieved from storage, the body and lid serial numbers were verified to match and the shipment was completed without further issue.

Discovery of the mismatched insert body and lid lead to an investigation of the discrepancy and MURR has initiated a Corrective Action Program issue (CAP 20-0096) to document and track root cause and corrective actions. The remaining stock of Model 3987 inserts was examined and all were found to have matching body and lid serial numbers. It was concluded that the corresponding mismatched body and lid had been used in a shipment the previous week, on September 18, 2020. This was confirmed when the package was returned and opened for inspection on September 25, 2020. The returned package contained insert Model 3987, body Serial Number 0022 and lid Serial Number 0020. The insert body and lid were immediately removed from service in compliance with MURR shipping program procedures. There were no abnormal dose rates or contamination levels found on either the exterior or interior of the returned package.

The Safkeg-HS shipment with the mismatched insert contained 1184 GBq (32 Ci) of I-131 (Liquid Sodium Iodide Solution), to be used by the recipient in the manufacture of a radio-pharmaceutical. As a result of the mismatch, the insert was not shipped in the same configuration as it was leak tested. The rest of the package was assembled in compliance with the CoC and SAR. The body and lid of the CV were matched, both having the same serial number. The CV was leak tested as per requirements and passed the test. The package arrived at its destination as scheduled and the recipient did not report any abnormalities when the package was opened.

In the operation and handling of the Model 3987 insert, the only situation where more than one unit has the body and lid separated at the same time is during the drying stage following a leak test. It was concluded that the mismatching of the bodies and lids occurred at this time. Section 7(a) of the CoC requires the installation new O-ring seals on the Model 3987 insert prior to each shipment and Section 8.2.2.2 of the SAR requires a bubble leak test after the replacement of the insert seal. The leak test requires the inserts to be submerged in liquid and the length of time required for the test makes it more efficient to do them in batches rather than one at a time. After the leak test, the body and lid of the insert must be separated to look for moisture in the interior and to allow thorough drying in a vacuum chamber prior to retuning them to service. The cause of the mismatch was a human performance error. The root cause was determined to be a weakness in leak test procedure BPB-SH-031, "Bubble Testing Acceptance



for Croft SAFKEG-HS Insert Model No. 3987". The procedure does not instruct the performer to match body/lid serial numbers as the inserts are reassembled.

MURR shipping staff missed an opportunity to identify the error while assembling the package for transport. Procedure BP-SH-028 and MURR Control Check Sheet FM-163, require the performer to record the insert serial number on the check sheet and verify that the body and lid numbers match. The performer must initial the check sheet verifying that these actions have been completed. In this instance the performer initialed the check sheet but failed to identify the mismatched serial numbers. This lack of attention to detail is classified as a human performance error.

(3) Assessment of safety consequences of the event

While the insert was not shipped in the same configuration as it was leak tested, there were no apparent safety consequences of the event.

The containment boundary of the Safkeg-HS package consists of the Containment Vessel flange/cavity wall, the CV lid and the inner O-ring. The inserts are not part of the containment boundary. The various inserts provide different degrees of shielding and confinement under normal conditions of transport. They also prevent the contamination of internal containment surfaces in the event the radioactive material container is breached.

The CV was assembled correctly and passed the pressure decay leak test prior to transport.

The recipient of the incorrectly configured package did not report any abnormal dose rates or contamination levels. In addition, when the package was surveyed on its return to MURR, there were no indications that any of the contents escaped from the insert.

(4) Description of corrective actions

- MURR procedure BPB-SH-031, "Bubble Testing Acceptance for Croft Safkeg-HS Insert Model No. 3987" has been revised to include a step requiring the performer to match the body and lid serial numbers as the insert is reassembled after the drying stage.
- MURR Form FM-163, "Control CheckSheet for Packaging of Type B Radioactive Material Using USA/9337/B(U)-96 (Safkeg-LS) and USA/938/B(U)-96 (Safkeg-HS)" has been revised to include a second individual review and initials for more individual steps on the sheet. This is in addition to the already existing initials by the Performer. Steps 5 and 6 already require the serial number of both the CV and the insert to be entered on the checksheet. The revision now requires entry of the serial numbers of both the body and the lid.



- All members of the radioactive material shipping staff were retrained prior to the next shipment using the Model 3987 insert. The retraining emphasized the following items:
 - A discussion of the performance error and the potential safety consequences.
 - Importance of carefully following instructions contained in procedures and completing each line item on checksheets.
 - Taking the time to pay attention to detail when packaging material for transport.
 - Review of the procedure revisions.

(5) Reference to similar events

MURR is not aware of any similar events.

(6) Licensee contact

For further discussion of this incident, please contact Daniel Doenges, Manager, Health Physics and Safety, at 573-882-5204 or danieldoenges@missouri.edu.

(7) Extent of exposure of individuals

There was no exposure to individuals as a result of this event.

Sincerely,

J David Robertson, Ph.D.
Executive Director

xc: Geoffrey Wertz, NRC Project Manager
Craig Basset, NRC Inspector
Croft, Certificate Holder
Reactor Advisory Committee
Reactor Safety Subcommittee